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November 22, 2000

Ms. Magalie R. Salas, Esq.
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: Joint Petition for Clarification or Partial Reconsideration, Submitted by 3Com, et al, ET Docket 99-231

Dear Ms. Salas:

Mobilian Corporation submits this letter in response to the Joint Petition for Clarification or, in the Alternative, Partial Reconsideration ("the Petition"), submitted by 3Com, et al, in regard to ET Docket 99-231: Amendment to Part 15 of the Commission's Rules for Spread Spectrum Devices. For the reasons set forth below, Mobilian urges the Commission to consider the proposal made in the Petition in a further notice of proposed rulemaking in this docket rather than acting on the petition in the reconsideration of the First Report and Order.

Mobilian Corporation has developed extensive expertise in managing the compatible operation of diverse systems in the unlicensed ISM bands. We are a member of WECA, HomeRF, a voting member of 802.15 (actively involved in TG2 and TG3) and 802.11 (actively involved in TGe and TGg) as well as an Associate member of the Bluetooth SIG. Because of our focus on multi-standard systems, coexistence is of paramount importance to us. For example, we have published an extensive white paper on 802.11b-Bluetooth™ coexistence[1], which gives detailed measurements and simulations of the interference issues between these two systems. Because we have focused a great deal of effort on analyzing interference between these two technologies and exploring options for improving coexistence between them, we are deeply interested in the concepts advanced in the Petition.

Adaptive frequency hopping has proven valuable in the 900MHz ISM band and there is reason to believe that similar techniques might also be used to improve

[1] This white paper is available at the following web site: http://www.mobilian.com

coexistence in the 2.4GHz band. However, Mobilian also recognizes that adaptive hopping, improperly defined and/or implemented, can significantly affect existing users in potentially unforeseen ways, in some cases even worsening the interference impact on systems that this proposal seeks to protect. While there was a great amount of debate and comment regarding the initial wideband frequency hopping (WBFH) proposal, which resulted in the First Report and Order, the issues raised in this current Petition have not been reviewed and scrutinized in-depth by the industry at large in an open dialog. Therefore, Mobilian cannot, in good conscience, support the specific parameters of the Petition. Rather, Mobilian's support is contingent upon a more detailed study that aims to optimize the selection of parameters upon which to base a rule change. Minimally we should work together to ensure that such a change does not inadvertently do more harm than good.

In particular, the Petition requests a "minimum hopset of 15 hopping frequencies for systems which employ the intelligent adaptive hopping techniques of Part 15.247(h) and limit their transmit power to no more than 125mW." We believe there are issues with this proposal that deserve further study:

1) A reduction for a 1 MHz system from 75 hopping channels to 15 channels is a reduction of processing gain from 18.8dB to 11.8dB.[2] This will significantly reduce the capability of FH systems to avoid mutual (or non-stationary) interference, unless Section 15.247(h) is further modified to allow coordinated FH. Mutual FH interference is likely to happen when all FH systems in an area are all avoiding the same quasi-stationary interferers, such as 802.11 devices or microwave ovens. No rationale is given for the choice of 15 channels, but it is assumed that this choice was made to be consistent with the wide channels specified in the First Report and Order. A relatively small hopset such as this is not conducive to operation of multiple networks in the same sub-band; an environment having multiple broadband systems would crowd the adaptive FH systems into one portion of the band, forcing high collision rates. In addition, since 802.11 WLAN systems have better sensitivity than required of Bluetooth™ systems, this "spectral crowding" could dramatically impact WLAN systems that such adaptive FH systems are unable to detect. Given these issues, we believe more study is needed to determine a more appropriate number of channels.

2) No rationale is given for the proposed wording in Appendix A of the Petition, which specifies occupancy of no more than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping frequencies employed. Mobilian is not convinced that this should be a linear relationship, given the arguments in ET Docket 99-231 to date over the relationship between

[2] Rappaport, Theodore S., *Wireless Communications Principles and Practice*, Prentice-Hall, 1996, p.278.

interference and occupied bandwidth. We believe more study is needed to insure that the spectral occupancy of these adaptive FH systems is appropriate.

3) The industry at large has not been given an opportunity to study, analyze, and comment upon the algorithms and techniques that are stated in the Petition and claimed to achieve significant results. Without an opportunity to verify these results, companies that are not part of this Petition are not able to assess thoroughly the impact of the proposed solution on the variety of ISM band devices that would be affected by this Petition.

4) The Petition specifies "intelligent" adaptive hopping, yet there is no definition of the term, and most importantly, there is no mention of the criteria by which a device would be evaluated for equipment authorization. Thus, there appears to be no clear method to prevent a device from subverting the provisions of Section 15.247(h) and coordinating hopset patterns between FH systems through use of "intelligent" adaptation. We believe the rules should give more guidance to the industry about what constitutes "intelligent" adaptation and whether this allows or precludes coordination under 15.247(h).

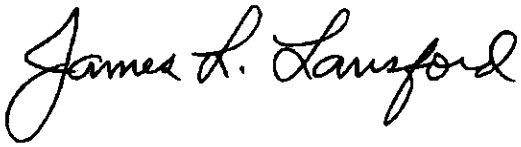
Mobilian is an active member of the IEEE802.15.2 Coexistence Working Group, which is currently soliciting proposals from the entire WLAN and WPAN industry for coexistence mechanisms in the 2.4GHz ISM band. This working group has compiled an extensive set of analysis and modeling tools to assess interference as well as gauge the potential improvements of proposed interference reduction mechanisms. To date, two proposals have been submitted, with more scheduled to be presented at the January, 2001 meeting.[3] At the November meeting, Mobilian made a proposal that achieves significant reductions in interference between 802.11b and Bluetooth™ systems without any changes to existing regulations or specifications[4]. Therefore, while we believe changes to the rules to permit adaptive hopping in the 2.4GHz ISM band could prove to be beneficial, we believe there are technical solutions that are available in the near term that are more than adequate until the industry as a whole can carefully study and comment on this Petition, and make recommendations to the Commission about the parameters that will optimize performance in an environment such as the ISM bands where systems are required to tolerate interference. [5]

As we stated at the outset, we believe adaptive frequency hopping could provide improved performance of Part 15 communication systems if the details of the approach truly enhance utilization of the band, as evidenced in ET Docket 96-8. While this

[3] To date one proposal on adaptive hopping has been presented, and several more are expected. The existing proposal did not claim dependence on a 15-channel minimum hopset to achieve benefits. It is also interesting to note that HomeRF currently uses an adaptive hopping algorithm that works under the existing 15.247 rules.
[4] See 00360r0P802-15_TG2-Mobilian_coexistence_proposal.ppt available from IEEE.
[5] As stated in §15.5 of the Rules.

Petition is relevant to ET Docket 99-231, we believe it requires further study before it should be cast into regulatory stone, because it significantly impacts the future of this ISM band usage as well as small businesses such as Mobilian that are seeking to create technical innovations. Mobilian therefore asks the Commission that this Petition be carried over and vetted in a further notice of proposed rulemaking so that the Commission can receive the benefit of the time and effort needed to determine the appropriate parameters and assess the impacts of such a proposal for adaptive frequency hopping. Mobilian also dutifully offers to make its tools and know-how in the area of coexistence available to the FCC to facilitate the detailed investigation that this Petition deserves.

Respectfully Submitted,



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